

## **REMARKS/ARGUMENTS**

Reconsideration of this application is requested. Claims 12-18 and 20-22 are in the case.

### **I. THE ANTICIPATION REJECTION**

Claims 12-15 and 18 are rejected under 35 U.S.C. §102(b) as allegedly anticipated by DeChellis (US 5,405,922). The rejection is respectfully traversed.

As claimed, there is provided a process for the copolymerisation of ethylene and an  $\alpha$ -olefin having 7 to 10 carbon atoms. The process comprises the steps of providing a fluidised bed gas phase reactor having a reaction zone and a recycle stream, providing a single site polymerisation catalyst in the gas phase reactor which is a metallocene complex represented by the general formula  $L_xMQ_n$  wherein L is a cyclopentadienyl ligand, M is titanium, zirconium or hafnium, Q is a leaving group and x and n are dependent on the oxidation state of the metal, and bringing the ethylene and the  $\alpha$ -olefin having 7 to 10 carbon atoms into contact with the single site polymerization catalyst in the reaction zone at a controlled reaction temperature under condensed mode conditions to form a monomer mixture. The condensed mode conditions in the reaction zone are provided by introducing the recycle stream comprising a liquid and a gas phase. The partial pressure of the  $\alpha$ -olefin in the reaction zone is maintained below an amount which would, at a temperature of 10°C less than the controlled reaction temperature of the monomer mixture in the reaction zone, be the saturated vapor

pressure of the  $\alpha$ -olefin, to thereby prevent condensation of the  $\alpha$ -olefin in the reaction zone.

It has been discovered, surprisingly, according to the present invention, that in order to operate copolymerizations using higher  $\alpha$ -olefins as comonomers in condensed mode operation, it is advantageous to operate the process in the presence of a metallocene complex comprising a metal selected from titanium, zirconium or hafnium, such that the amount of the  $\alpha$ -olefin is maintained below that at which substantial condensation in the reactor occurs. Thus, according to the claimed process, the partial pressure of the  $\alpha$ -olefin in the reaction zone is maintained below an amount which would, at a temperature of 10°C less than the temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of the  $\alpha$ -olefin to prevent condensation of the  $\alpha$ -olefin in the reaction zone.

The claimed process is operated under condensed mode conditions by use of, for example, a suitable inert substance in the recycle stream, and such that the amount of the  $\alpha$ -olefin (e.g., octene) is maintained below that at which substantial condensation in the reactor occurs. Condensed mode operation is defined in the specification (page 2) as purposefully introducing a recycle stream having a liquid and a gas phase into the reactor. This is specifically recited in the claims. The introduction is achieved by condensation of the recycle stream **in a heat exchanger**, and **not** in the reactor. The condensation is achieved by means of cooling an inert condensate present in the recycle stream, e.g., pentane.

The condensed mode conditions in the reaction zone are provided by introducing the recycle stream comprising a liquid and a gas phase. By use of the claimed process

conditions, higher  $\alpha$ -olefins may be successfully employed in a gas phase process provided the amount of higher  $\alpha$ -olefin comonomer is maintained below that at which substantial condensation occurs. Such operation is also dependent upon the operation temperature and the boiling point of the higher  $\alpha$ -olefin. The process is particularly advantageous when performed in the presence of a metallocene complex comprising a metal selected from titanium, zirconium or hafnium, as now claimed, which is able to incorporate high levels of comonomers at low comonomer inventories.

DeChellis discloses a gas phase process operating under condensed mode conditions in the presence of a metallocene catalyst system. DeChellis discloses operating the condensed mode process in the presence of metallocenes at higher levels of liquid in the recycle stream than in previous processes operating in condensed mode. In DeChellis, the amount of the liquid in the recycle stream is in the range 2 to 50 wt % (DeChellis, col. 8, lines 20–28), as compared with < 20 wt % in Jenkins (Jenkins '399, col. 4, lines 13–21 or Jenkins '790, col. 6, lines 47–56, of record). Thus, DeChellis allows for a greater cooling capacity in the fluidized bed because higher liquid levels in the recycled stream. This is achieved in DeChellis by having > 2 mole % of a dew point increasing component in the recycle stream.

Other factors DeChellis are the comonomer/monomer ratio and the hydrogen/monomer ratio. This may be seen from the tables in DeChellis in which levels of condensation up to 41.8 % may be achieved based on a level of over 40 mole % of the dew point increasing component /condensable (see Table 4 run 15).

The Action asserts that since the reaction conditions in DeChellis are similar to those in the present invention, it is inherent that the result will be that there is substantially no condensation in the reactor. Applicants disagree.

In order to establish anticipation by inherency, the Office must show that the subject matter not disclosed in the cited reference is "necessarily present". Thus, as stated in *In re Oelrich*, 666 F.2d 578, 581-82, 212 USPQ 323, 326 (CCPA 1981):

"To establish inherency, the extrinsic evidence 'must make clear that the missing descriptive matter is **necessarily present** in the thing described in the reference, and that it would be so recognized by persons of ordinary skill. Inherency, however, may not be established by probabilities or possibilities. The mere fact that a certain thing **may** result from a given set of circumstances is not sufficient.' " (Emphasis added)

Thus, in relying upon a theory of inherency, the Office must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic "necessarily flows from the teachings of the applied prior art". See: *Ex parte Levy*, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990) (emphasis in original).

In the presently claimed invention, an important recited feature is the requirement that **the partial pressure of the alpha-olefin is maintained below an amount which would at a temperature of 10°C less than the controlled reaction temperature of the monomer mixture in the reaction zone, be the saturated vapor pressure of the alpha-olefin**. In this way, condensation of the alpha-olefin in the reactor is prevented.

As noted above, and in the Action, the level of condensation in the reactor is controlled by the amount of comonomer and the temperature and partial pressures in

the reaction zone. Hence, there are a number of **variables** which are relevant to maintaining a level of condensation.

In DeChellis, the amounts of monomer, comonomer and hydrogen are adjusted in order to control the properties of the resultant polymers, such as melt index and density (col. 5, lines 39–col. 6, line 36). The productivity of the catalysts in DeChellis is also influenced by the comonomer /monomer ratios. Moreover, in DeChellis, it is preferred that there is at least a 5.6°C temperature difference between the dew point temperature and the reactor temperature (col. 6, line 66 – col. 7, line 3). This is to ensure that there is no sticking together of the polymer particles at too high reactor temperatures (col. 6, lines 51–60). By making these adjustments, DeChellis is allegedly able to operate at higher reactor temperatures taking advantage of the increased cooling capacity of the much higher liquid levels used in the condensation mode process, particularly with the higher active metallocene catalysts (col. 7, lines 8–15). DeChellis discloses very broad operating ranges for both temperature and pressure (col. 8, lines 42–68), and these are typical of such condensed mode operation. Although some examples in DeChellis are directed to the copolymerization of ethylene and 1-octene, the general teaching is to the copolymerization of ethylene and  $\alpha$ -olefins as is typical of such fluidized bed processes.

Based on the disclosure of DeChellis and the number of possible variables involved, it is clear that the Office has not established that the conditions which prevent condensation within the reactor are “necessarily present” in DeChellis all the time. DeChellis does not therefore anticipate the presently claimed invention, either explicitly or inherently. Withdrawal of the anticipation rejection is respectfully requested.

## **II. THE OBVIOUSNESS REJECTIONS**

Claims 20 and 22 are rejected under 35 U.S.C. §103(a) as allegedly unpatentable over DeChellis in view of Nickias (WO 93/08199). Claims 21 is rejected under 35 U.S.C. §103(a) as allegedly unpatentable over DeChellis in view of Nickias as evidenced by Wilson (US 5,659,054) and further in view of Devore (US 5,470,993). Claims 12-18, 20 and 22 rejected under 35 U.S.C. §103(a) as allegedly unpatentable over Agapiou (US 7,244,795). The rejections are respectfully traversed.

Referring to the rejection of claims 20 and 22, those claims are dependent on claim 12 and relate to preferred metallocene catalysts of the present invention. While such metallocenes are known in the literature (Nickias), Nickias does not otherwise cure the deficiencies of DeChellis, discussed above. Withdrawal of the obviousness rejection of claims 20 and 22 over DeChellis in view of Nickias is respectfully requested.

With regard to the obviousness rejection of claim 21 over DeChellis, Nikias, Wilson and Devore, claim 21 is dependent on claim 12, and the same comments apply as stated above with regard to claims 20 and 22. Withdrawal of the obviousness rejection of claim 21 over DeChellis, Nikias, Wilson and Devore is respectfully requested.

With reference to the obviousness rejection of claims 12–18, 20 and 22 over Agapiou, that reference is not specifically directed to operation in condensed mode but discloses (col. 22, lines 55–58) a gas phase process in which some of the recirculated gases may be cooled and compressed to form liquids which increases the heat removal capacity of the returned gas stream. This represents a general disclosure of a condensed mode of operation, and there is no suggestion of the invention as claimed.

Withdrawal of the obviousness rejection of claims 12–18, 20 and 22 over Agapiou is respectfully requested.

**III. AMENDMENTS**

The claims have been amended to correct minor grammatical errors. No new matter is entered.

Favorable action is awaited.

Respectfully submitted,

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